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COMPOSITAE OF CENTRAL AMERICA–I. THE TUSSILAGINOID GENUS *ROBINSONECIO* (SENECIONEAE), MICROCHARACTERS, GENERIC DELIMITATION, AND EXCLUSION OF SENECIOID *SENECIO CUCHUMATANENSIS*

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ABSTRACT

Robinsonecio has tussilaginoid microcharacters and is represented in Central America by a single species, the generitype *Robinsonecio gerberifolius*. A lectotype is designated for *Senecio gerberifolius*. *Senecio cuchumatanensis* of Guatemala has been suggested to be a congener of *R. gerberifolius*, but its senecioid microcharacters are found here to exclude it from *Robinsonecio*.

KEY WORDS: Asteraceae, Central America, Compositae, Guatemala, Mexico, *Robinsonecio*, *Robinsonecio gerberifolius*, *Senecio cuchumatanensis*, *Senecio gerberifolius*, Senecioneae.

Robinsonecio T.M. Barkley & Janovec (Compositae: Senecioneae: Tussilagininae) was segregated from the Lugentes subgroup (Barkley 1985) of *Senecio* L. (Senecioninae) based on its tussilaginoid microcharacters (often called "cacalioid" microcharacters, e.g., Robinson & Brettell 1973b, 1973b; Wetter 1983). The genus includes 2 species — *R. gerberifolius* (Sch. Bip. ex Hemsl.) T.M. Barkley & Janovec (alpine areas in southeastern Mexico and western Guatemala) and *R. porphyresthes* (T.M. Barkley) T.M. Barkley & Janovec (Tamaulipas, Mexico). Barkley and Janovec (1996) noted that in *Robinsonecio* each style branch has a continuous stigmatic surface and that its anther collars are cylindrical, each character a tussilaginoid trait (Koyama 1967; Robinson & Brettell 1973b; Nordenstam 1978; Wetter 1983). While many tussilaginoid Senecioneae have polarized endothecial cell wall thickenings (Dormer 1962; Robinson & Brettell 1973b; Nordenstam 1978; Wetter 1983), Barkley and Janovec (1996) characterized the endothecium of *R. gerberifolius* as polarized and that of *R. porphyresthes* as radial.

Hemsley (1881) described *Robinsonecio gerberifolius* (sub *Senecio*) as having pubescent cypselae, whereas Barkley and Janovec (1996) gave the cypselae as glabrous. Williams (1975) allied *R. gerberifolius* (sub *Senecio*) with *S. cuchumatanensis*, and indeed these two species are subscapose herbs known only from similar montane habitats. Barkley and Janovec (1996) noted that *S. cuchumatanensis* is similar in "gross aspect" to *Robinsonecio*, but they did not provide a nomenclatural transfer commenting that this must "await further information." Subsequently, Barkley (en schedula MO) annotated the type and paratype material of *S. cuchumatanensis* as *Robinsonecio* using a non-published binomial based on *S. cuchumatanensis*.

The present study supports *Robinsonecio* as belonging to the tussilaginoid generic alliance (subtribe Tussilagininae), evidenced by its cylindrical anther collars (fig. 1A–B) that are no broader than the filaments and by its style branches (fig. 1E) each with a continuous stigmatic surface. However, I find *R. gerberifolius* to have adaxial endothecial tissue composed of elongate cells each with a radial cell wall thickening pattern (fig. 1C), and with only a thin line of elongate cells of the non-polliniferous connate zone between adjacent anther thecae as having polar thickenings (fig. 1D). It should be noted that while, for example, Jeffrey and Chen (1984) characterized the Tussilagininae

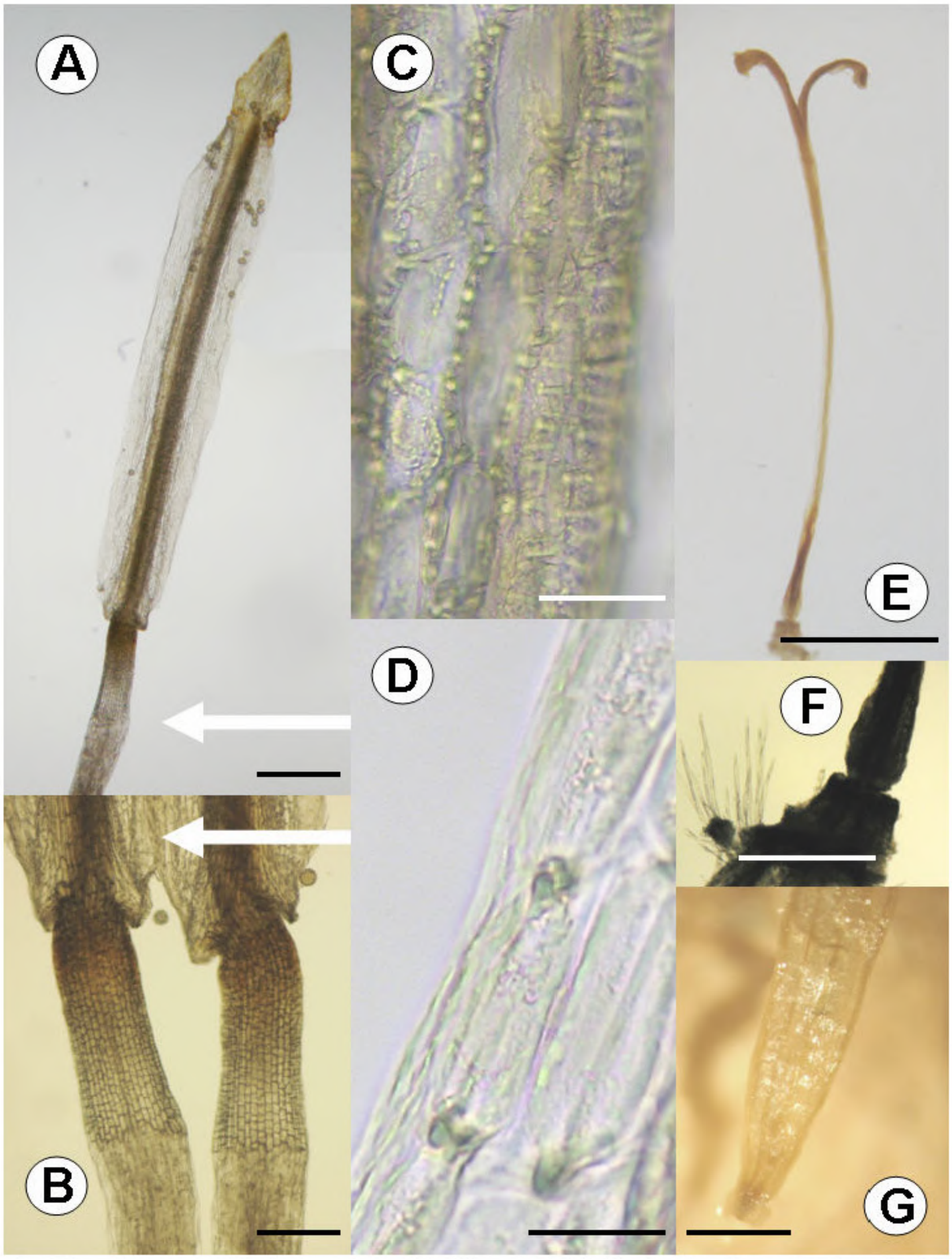

Figure 1. Microcharacters of *Robinsonecio gerberifolius*. A. Individual anther theca showing abaxial face of anther collar-filament juncture (arrow) and apically acute anther appendage. B. Abaxial close-up of the cylindrical tussilaginoid anther collars with arrow pointing to (basal portion of) connate zone between two adjacent anther thecae. C. Medial adaxial endothecial tissue with radially thickened (transversely ribbed) cell walls. D. Medial adaxial border of individual anther showing connate zone cells with thickenings at their poles. E. Style showing slightly dilated stipitate base sitting atop the basal nectary rather than immersed within nectary. F. Close-up of style base, nectary, and apical portion of a pilose ovary. G. Glabrous cypsela. (A–D, G from *Pruski & Ortiz 4163*, MO; E–F from *Garcia et al. 1901*, MO). [Scale bars: A 0.3 mm; B 0.1 mm; C, D 20 µm; E 2 mm; F 0.2 mm; G 1 mm.]

as having polarized endothecial tissue composed of nearly isodiametric cells (as indeed is a tendency, especially in Asian genera of the subtribe), both Dormer (1962) and Wetter (1983) noted some intraspecific variation in this character. Although *Robinsonecio,* by radiate capitula and yellow disk corollas with lobes shorter than the throats, does not match the "cacalioid condition" (Pippen 1968), several Central American genera subsequently accepted as tussilaginoid (Barkley et al. 1996) have radiate capitula, yellow corollas, and short disk corolla lobes. The disk corolla lobes of *R. gerberifolius* are triangular-lanceolate to lanceolate and its anther appendages are acute apically (fig. 1A). The styles of *R. gerberifolius* are only slightly dilated at the base. This basal stylar node is not immersed in the nectary, but rather sits on a stipe atop the nectary (fig. 1E–F) as in the free stylopodium type 1 in Wetter (1983: figs. 14 and 17). The ovaries and cypselae of *R. gerberifolius* have carpopodia that, as noted by Barkley and Janovec (1996), are moderately developed (fig. 1G). As described by García-Peréz (2001), the ovaries and cypselae of *R. gerberifolius* vary from being glabrous to pilose (fig. 1F–G). Elsewhere, for example, Koyama (1967) noted similar intraspecific cypselae indumentum variation in Asian taxa.

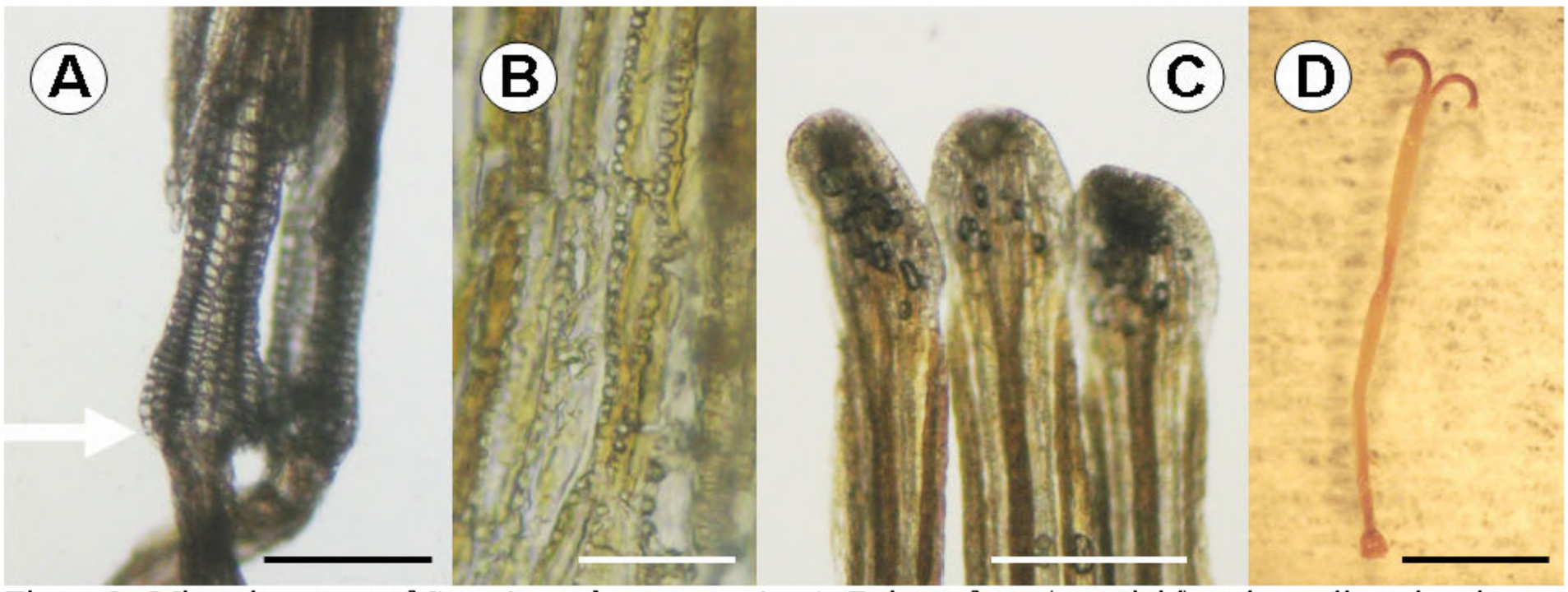

Figure 2. Microcharacters of *Senecio cuchumatanensis*. A. Balusterform (senecioid) anther collars showing on the anther on the left the abaxial junction (arrow) with the narrower filaments. B. Medial adaxial endothecial tissue with radially thickened cell walls. C. Broadly rounded anther appendage apices. D. Style showing abruptly dilated style base (not showing nectary). (all from *Steyermark 50117*, MO, a paratype). [Scale bars: A, C 0.2 mm; B 30 µm; D 2 mm.]

These microcharacters of *Robinsonecio* contrast with those of *S. cuchumatanensis*, which has the senecioid microcharacters of (1) moderately balusterform (distal cells somewhat quadrangular and basal cells isodiametric, with slight cell wall thickening basally) anther collars broader than the filaments (fig. 2A) and (2) each style branch (fig. 2D) with a 2-banded stigmatic surface with clear "morphological distinction between the cells" (Wetter 1983) of the stigmatic surfaces and those of the medial groove. *Senecio cuchumatanensis* differs further from *Robinsonecio* by triangular disk corolla lobes, apically broadly rounded anther appendages (fig. 2C), and by its abruptly dilated large-celled style bases (fig. 2D) that arise within the low annular (slightly darker colored, slightly wider) nectaries. This stylopodium type more or less matches the "partially immersed" configuration seen in Wetter (1983: fig. 16), but the style base in *S. cuchumatanensis* is much more dilated than in any of the six tussilaginoid photographs in Wetter (1983: figs. 14–19). Although Wetter (1983) notes stylopodial features as notoriously variable, here it appears to be useful taxonomically. *Senecio cuchumatanensis* may thus be safely excluded from *Robinsonecio* and retained in *Senecio*. Although *S. cuchumatanensis* has a radial endothecial pattern (fig. 2B) similar to that typical for *Robinsonecio* (fig. 1C), nearly all senecioid genera and most American tussilaginoid genera share this radial endothecial condition.

The purpose of the present account is to illustrate the microcharacters used to circumscribe *Robinsonecio*, to provide an expanded description of *R. gerberifolius* that may be inserted into Williams (1976), and to show that on the basis of microcharacters *S. cuchumatanensis* should not continue to be aligned with *Robinsonecio*. While both *R. gerberifolius* and *S. cuchumatanensis* are subscapose herbs occurring in the Sierra de los Cuchumatanes, with *S. cuchumatanensis* endemic to this range, the similarities between these two species are basically incidental.

Figure 3. *Robinsonecio gerberifolius*, showing the subscapose habit, the prominent basal rosette, and radical leaves adaxially nitidous with impressed midribs. (*Pruski & Ortiz 4163*).

ROBINSONECIO T.M. Barkley & Janovec, Sida 17: 79. 1996. **TYPE:** *Senecio gerberifolius* Sch. Bip. ex Hemsl. [≡ *Robinsonecio gerberifolius* (Sch. Bip. ex Hemsl.) T.M. Barkley & Janovec].

Small subscapose perennial rosulate herbs, caudex thick, root fibrous; scapes 1(–2) per plant, basally copiously floccose to lanate, sometimes glabrate distally, rosette prominent (Fig. 3), cauline leaves remote and reduced; herbage lanate to glabrate, eglandular. **Rosette leaves** spirally alternate; blade secondary venation indistinct, base gradually attenuate onto narrowly winged petiolar base that is dilated near caudex, margins entire to remotely denticulate, sometimes revolute, surfaces often discolorous. **Cauline leaves** sessile, margins entire. **Capitulescence** erect or ascending, laxly cymose, 1–6-capitulate. **Capitula** radiate; involucre campanulate, irregularly and loosely calyculate; phyllaries 13–20, imbricate, arachnoid or villous at least proximally, often glabrate distally, margins of inner phyllaries sometimes broadly scarious; receptacle solid. **Ray florets** pistillate; corolla yellow or golden-yellow, limb well-exserted. **Disk florets** bisexual, slightly exserted from involucre; corolla narrowly funnelform, yellow, glabrous, tube and limb subequal, lobes triangular-lanceolate to lanceolate, ascending to sometimes slightly spreading, with or without a medial resin duct; anthers mostly included, collar cylindrical, equal in diameter to filaments, thecae base obtuse, not caudate, endothecial tissue typically radial, apical appendage triangular, acute apically; style base cylindrical to slightly dilated and sitting atop the basal nectary rather than immersed within nectary, branches weakly exserted, slightly recurved, apex obtuse to truncate, papillose in a subapical-abaxial semicircle below apex, stigmatic surface continuous. **Cypselae** cylindrical, 10-nerved, base gradually narrowed, carpopodium prominent; pappus bristles of rays and disks similar, white, barbellate, about as long as the disk corollas. $x = 30$.

Robinsonecio is defined primarily by the tussilaginoid microcharacters of cylindrical anther collars and continuous stigmatic surfaces, and secondarily by subscapose habit, radiate capitula, yellow disk corollas with triangular-lanceolate lobes, and acute anther appendage apices. The genus consists of two species and is centered in Mexico, but the following species is disjunct from Pico de Orizaba to the Sierra de los Cuchumatanes in Guatemala.

ROBINSONECIO GERBERIFOLIUS (Sch. Bip. ex Hemsl.) T.M. Barkley & Janovec, Sida 17: 79. 1996. *Senecio gerberifolius* Sch. Bip. ex Hemsl., Biol. Cent.-Amer., Bot. 2: 240. 1881, as "gerberaefolius." **LECTOTYPE** (designated here): **MEXICO. Veracruz-Puebla border**. Pico de Orizaba, 3500 m (as "11500 ft"), Apr 1838, *Linden 487* (lectotype: K, left-hand side, photo in MO; isolectotype: GH). (Figs. 1, 3–4).

Herbs 15–33 cm tall, scapes usually 1–3-leaved. **Rosette leaves** long-petiolariform, spreading to patent; blade 2–15 × 0.7–2.5(–3.5) cm, narrowly oblanceolate or oblong to spatulate or obovate, subcoriaceous, midrib sometimes impressed adaxially, apex acute to less commonly obtuse, slightly to obviously discolorous, adaxial surface gray-green to green, sometimes nitidous, arachnoid-floccose to glabrate, abaxial surface grayish-white, tomentose to lanate; petiolar base 1–8 cm long. **Cauline leaves** 1–3; blade 2–7 cm long, lanceolate or infrequently oblanceolate, semiamplexicaule. **Capitulescence** scape 14–31.2 cm long, striate or few-angled, densely floccose or lanate to sometimes arachnoid or glabrate in patches; peduncles (when pluricephalous) 1–8(–10) cm long. **Capitula** 10–18 mm tall; involucre 10–15 mm diam., loosely arachnoid-floccose in bud; phyllaries ca. 13, 8–13 × 2–3.5 mm, elliptic-lanceolate to narrowly ovate, typically greenish-yellow throughout, pluristriate, arachnoid proximally and glabrate distally, apex acute, sometimes purplish; calycular bracteoles 1–5(–7), 7–12 × 0.7–1.1 mm, about 3/4 as long as the phyllaries, linear-lanceolate, green; receptacle convex, foveolate. **Ray florets** usually 13(11–15); corolla tube 5–6 mm long, limb 11–15 × 3–4 mm, elliptic-lanceolate, 4–9-nerved, 3-denticulate, apical teeth 0.1–0.3 mm long. **Disk florets** 35–65; corolla 8–10 mm long, lobes 1–1.6 mm long, typically with a medial resin duct; anthers 2.5–3

mm long, endothecial tissue radial or sometimes polarized, non-polliniferous connate zone between anthers usual with cells thickened at poles; style branches 1.2–1.5 mm long. **Cypselae** 3–4 mm long, brown, glabrous to pilose, trichomes to 0.5+ mm long; pappus 6.5–8.5 mm long. $2n = 60$.

Representative specimens examined. MEXICO. Mexico. Telapón, 4000 m, Dec 1928, *Lyonnet 395* (MO, NY); Ixtaccíhuatl, subalpine region, Oct 1905, *Purpus 1516* (F, MO, NY). **Puebla**. Slopes of Ixtaccíhuatl above Huejotzingo, 4260 m, 21 Oct 1945, *Hernández & Sharp X-154* (MO). **Veracruz**. Cerca de la Roca del Cofre Perote, 4000 m, 28 Aug 1971, *Dorantes 324* (MO, XAL); Cima del Volcán Cofre de Perote, 4180 m, 2 Oct 1984, *Garcia et al. 1901* (MO). **Veracruz-Puebla border**. Pico de Orizaba, 3048–4552 m (as 10000–15300 ft.), *Liebmann 8853 (species number 140)* (C [photograph sub Macbride negative #22623 in MO], K); Pico de Orizaba, volcanic ash, ca. 4 km N of summit, 3925 m, 15 Feb 2007, *Pruski & Ortiz 4163* (MO). **GUATEMALA. Huehuetenango**. Cumbre de la Sierra de los Cuchumatanes, 28 Dec 1940, *Standley 81489* (F); On high limestone bluff of Caxín, between Tojquiá and Caxín bluff, summit of Sierra de los Cuchumatanes, 3700 m, 6 Aug 1942, *Steyermark 50181* (F, MO).

Distribution and ecology. *Robinsonecio gerberifolius* is known from alpine and subalpine pine forests, rocky areas, and meadows where it flowers sporadically throughout the year, but with a peak seemingly between July–December. The species is typified by material from Pico de Orizaba, the highest mountain in Mexico, and also occurs on Nevado de Toluca (García-Peréz 2001), a very few other high summits in the Trans Mexican Volcanic Belt, and the Sierra de los Cuchumatanes range in Guatemala. Although it does not seem to be known in Chiapas (Breedlove 1986), it should be looked for on Volcán Tacaná along the Chiapas–Guatemala border.

Typology. Barkley and Janovec (1996) listed *Linden 487* in GH as an isotype. Although *Linden 487* is mechanically the first of three syntypes and the typology of Barkley and Janovec (1996) indicates basically that they saw authentic material of one of the three syntypes, it nevertheless seems appropriate to formally designate *Linden 487* in K as the lectotype of this name.

Although *Robinsonecio gerberifolius* has cypselae that vary from glabrous to pilose (fig. 1F–G), capitula with 1–5(–7) calycular bracts, and the Guatemalan plants are very narrow-leaved, I too circumscribe *R. gerberifolius* broadly and apply this name to material from Guatemala as per the Jesse Greenman determination (albeit within "*Senecio* sect. *Tomentosi* Rydb." sensu Greenman 1901, 1902) of *Steyermark 50178* (F, MO) and as treated in the specimens examined section by Barkley and Janovec (1996).

Excluded species: **Senecio cuchumatanensis** L.O. Williams & Ant. Molina, *Phytologia* 31: 438. 1975. **TYPE: GUATEMALA. Huehuetenango.** On high limestone bluff of Caxín, between Tojquiá and Caxín bluff, summit of Sierra de los Cuchumatanes, 3700 m, 6 Aug 1942, *Steyermark 50170* [as "50107"] (holotype: F, photograph in MO; isotype: MO). (Fig. 2).

Senecio cuchumatanensis was noted by Williams (1975) as resembling *R. gerberifolius*, suggested by Barkley and Janovec (1996) as a possible species of *Robinsonecio*, and type material of this name was subsequently annotated by Barkley (en schedula MO) as a species of *Robinsonecio*. Although the species is know to me from only two badly bug-damaged collections, its technical features are intact. This species is shown here as having senecioid microcharacters and is retained in *Senecio*.

Figure 4. *Robinsonecio gerberifolius*, showing a few pine needles embedded in the basal rosette. (*Pruski & Ortiz 4163,* MO).

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